# KiteFAST Submodel Hierarchy

## KiteMBDyn Preprocessor
- Functionality: Generates MBDyn input files based on energy kite properties
- Source Code: New

## MBDyn
Structural Dynamics
- Physics: Time-domain structural dynamics
  Phase 1 – 6 DOF rigid body
  Phase 2 – Beam elements
- Components: Energy kite
- Source Code: Existing MBDyn

Driver
- Functionality: Drives time-domain solution forward
- Source Code: Existing MBDyn

## KiteAeroDyn Driver
- Functionality: Runs KiteAeroDyn in standalone mode by prescribing time-domain 6-DOF kite motion, rotor speed, and controller settings of energy kite in steady wind
- Source Code: Modify existing AeroDyn Driver

## KiteFASTMBD
- Functionality: Interfaces modules
- Source Code: Modify existing FAST Driver

## KiteAeroDyn
- Functionality: Interfaces submodules
- Physics: Geometric AoA of fuselage
- Source Code: Modify existing AeroDyn

## InflowWind
- Physics: Processes ambient wind inflow (steady, uniform e.g. from IECWind, or turbulent e.g. from TurbSim)
- Components: Ambient wind
- Source Code: Existing

## MoorDyn
- Physics: Time-domain cable dynamics
- Components: Tether
- Source Code: Existing

## Controller
- Physics: Controller and safety system logic
- Components: Controller and safety system
- Source Code: Existing (from Makani)

## AirfoilInfo
- Physics: Quasi-steady lifting line to calculate Cl/Cd/Cm dependent on AoA and control setting
- Components: Wing, vertical stabilizer, horizontal stabilizer, pylons, fuselage, and control surfaces (flaps, ailerons, rudder, elevator)
- Source Code: Modify existing AirfoilInflow to include control setting

## KiteVSM
- Physics: Vortex step method for computing induced velocities for lifting lines
- Components: Wake from wing, vertical stabilizer, horizontal stabilizer, and pylons
- Source Code: New

## ActuatorDisk
- Physics: Quasi-steady actuator disk to calculate power/3 forces/3 moments dependent on TSR and inflow skew
- Components: Rotors – One instance for each rotor
- Source Code: New – Inputs Come from existing AeroDyn Driver or other sources

## Not Shown
Phase 3 – Rotor wake
Phase 4 – Tether aerodynamics